

1. Identification Information

1.1 Citation Information

8.1 Originator: Belle W. Baruch Institute for Marine Biology and Coastal Research

8.1 Originator: North Inlet-Winyah Bay (NIW) National Estuarine Research Reserve

8.2 Publication Date: 20030328

8.4 Title: North Inlet-Winyah Bay National Estuarine Research Reserve's (NERR) Estuarine Surface Water Nutrient, Suspended Sediment, and Chlorophyll a Data for the North Inlet and Winyah Bay Estuaries, Georgetown, South Carolina: 1993-2001

8.5 Edition: Second Edition

8.6 Geospatial Data Presentation Form: comma delimited digital data and spreadsheet

8.7 Series Information

8.7.1 Series Name: Baruch Institute's Water Chemistry, Chlorophyll a, and Suspended Sediment Long-Term Monitoring Database for the North Inlet Estuary, South Carolina

8.7.2 Issue Identification: June 30, 1993 - December 31, 2001

8.8 Publication Information:

8.8.1 Publication Place: Georgetown, South Carolina, USA

8.8.2 Publisher: Belle W. Baruch Institute for Marine Biology and Coastal Research, University of South Carolina

8.9 Other Citation Details: These data were collected under the auspices and protocols of the North Inlet-Winyah Bay NERR. The National Estuarine Research Reserve's (NERR's) System-Wide Monitoring Program (SWMP) began their own protocols in the year 2002.

8.10 Online linkage: <http://links.baruch.sc.edu/data/>

1.2 Description

1.2.1 Abstract:

A one 1000 ml (one Liter) water sample was collected every 20 days at 2 hour and 4 minute intervals for 2 complete tidal cycles (26 hours) with an ISCO automated water sampler at a depth of 0.5 meters below the water's surface. The water samples were brought into the lab and analyzed for salinity, chlorophyll a, nitrogen (total whole and dissolved, ammonia, and nitrate-nitrite), phosphorus (total and dissolved and ortho phosphate), dissolved organic carbon, suspended sediment (total suspended sediment, inorganic suspended sediment, organic suspended sediment), and suspended sediment color. Tide stage based on published NOAA tide charts for each sample were also included in the database. Samples were simultaneously collected from three of the four sample sites. Three sites are located in salt marsh tidal creeks found in the North Inlet Estuary. These samples are taken at the end of Oyster Landing dock (OL) in Crab Haul Creek, the upper reaches of Debidue Creek (DC) near the boundary between Hobcaw Barony and the Debordieu Colony, and Clambank Landing Dock (CB) in Clambank Creek. The other site is located adjacent to the Winyah Bay Estuary. The Thousand Acre (TA) samples are taken near the mouth of a small tidal creek that connects the Thousand Acre Rice Field to Winyah Bay. For more information on the sample sites, see the Description of Geographic Extent Section.

1.2.2 Purpose:

The NERR 20 day water chemistry (NERRWCHEM) database is essentially a continuation of the Long-Term Ecological Research Daily Water Sample 1978-1993 (LTERDWS) database whose purpose was to monitor nutrient cycling in the North Inlet Estuary, Georgetown, SC (see Cross Reference Section). The NERR 20 day water chemistry program was initiated in June of 1993 to continue the monitoring of nutrients in the North Inlet Estuary system and also to continue the long-term database on the nutrient concentration dynamics of the North Inlet salt marsh estuarine system. Because the LTERDWS water sampling collections were taken every day at 10:00am EST, it was determined that the nutrient data are biased for Spring high tides; not all tides levels would be represented. The new NERRWCHEM sampling protocols (based on a 10 day cycle) sample all tidal stages over the years. A larger purpose of this monitoring program is to combine the water chemistry, chlorophyll a, and suspended sediment monitoring data with other existing North Inlet ecological monitoring data to provide ecosystem level information and understanding.

1.2.3. Supplemental Information:

The protocols for the analysis of water samples for NERRWCHEM and LTERDWS are identical. The sampling strategy is the only difference between the two databases. The DWS data were gathered by submerging a one liter bottle into the surface waters at 10:00 am on a daily basis by a technician, while the NERR samples are collected every 2 hours and 4 minutes for a 26-hour period every 20 days, by an autosampler. The LTERDWS data contains a few additional water parameters and records tide elevations from an actual tide staff or water level readings, as opposed to assigning a level based on tide charts. Oyster Landing, Debidue Creek, and Clambank are the monitoring sites utilized in both databases; the LTERDWS database also included Town Creek and the NERRWCHEM database includes Thousand Acre.

In 1992, a study was conducted to compare the water chemistry results obtained from the LTER DWS sampling protocol and the proposed NERRWCHEM protocol. There were no significant differences observed between the two methods, except for

an increase in sediment load found in the autosampler samples. (See the Ancillary Data portion of the documentation for more information.) Additional comparisons of overlapping data (all parameters) from the two studies in June of 1993 showed that the NERRWCHEM measurements were within the expected range based on LTER DWS data. All available results and documentation for both of these comparison studies were archived on the NERRWCHEM 1993-2001 CD's and in the NERRWCHEM 1993-2001 Notebook as part of the 2003 Data Rescue Project.

Tide Height or Stage:

Sampling events always begin and end on predicted slack low tide (SL) and cover two tide cycles, one in the day and one at night. The timing of SL for the North Inlet sites (DC, CB, OL) is different than the timing of SL for the Winyah Bay site (TA), due to the distances away from the ocean, runoff, and river flow. Therefore, sample times for each site do not match exactly within a sample event, but tide stages or levels do. Sample times were determined based on predicted tide elevations from NOAA tide charts for Charleston, SC. A study was conducted to determine how much variation there was between North Inlet tides (at OL, DC, and CB) and the predicted times for Charleston. It was determined that the North Inlet times were not different by more than 5 to 10 minutes. Estimated times for the Winyah Bay site were attained by comparing the water quality data logger water level measurements between the North Inlet sites and Thousand Acre. It was determined that slack low for the TA site was one hour and 30 minutes later than the North Inlet sites. However, there can be a great deal of variability in tide stage at all sites due to wind, rain, and river flow; TA site is the most variable. Tides can be delayed anywhere from one to two hours from the predicted.

Chlorophyll a:

It was discovered that the fluorometer used to analyze samples for Chlorophyll a began to produce inaccurate readings in the fall of 1999. The problem was not recognized until May of 2001, and by then, a large number of samples had been analyzed. Samples are often analyzed only after several sample events have been collected. Any effort to correct the data for degradation of the fluorometer's readings is therefore reliant on the date the sample was processed, not necessarily the date of collection. Baruch technicians devised a method for correcting some of the data, but the Data Manager determined that, without documentation of the date the sample was processed, corrections could not be made with enough assurance of accuracy. Therefore, data for the time period of 11/18/1999 through 4/22/2001 have been removed from the data set and replaced with missing data markers ".". **Although the data immediately prior to 11/18/1999 appear "normal" and have been retained in the dataset, they should be used with caution.** Without documentation of sample processing dates, we cannot be sure that earlier data weren't also processed after the fluorometer began to fail. Current protocol calls for the documentation of sample processing dates. Users interested in obtaining the Chl a data that were removed should contact Baruch's Data Manager.

1.3 Time Period of Content:

9.3 Range of Dates/Times

9.3.1 Beginning Date: 19930602

9.3.2 Beginning Time: 1220 EST

9.3.3 Ending Date: 20011218

9.3.4 Ending Time: 0354 EST

1.3.1 Currentness Reference: Observed

1.4 Status:

1.4.1 Progress: Complete

1.4.2 Maintenance and update frequency: As needed

99.1.5.1 Description of Geographic Extent:

The North Inlet-Winyah Bay National Estuarine Research Reserve is located on the southeastern coast of the United States on the Atlantic Ocean in two tidal estuaries, North Inlet and Winyah Bay, near Georgetown, South Carolina. The North Inlet estuary, located approximately 10 km east of Georgetown, is a bar-built Class C type estuary (Pritchard, 1955). The North Inlet estuary is composed of numerous winding tidal creeks, and is considered a pristine tidal estuary due to minimal anthropogenic impacts. The watershed drains a 24.8 km² area of mostly pine forest and a moderately developed residential watershed to the north. The Winyah Bay estuary, classified as a Class B type estuary by Pritchard (1955), which originates in the Blue Ridge Mountains of North Carolina, is one of the largest river-estuary ecosystems on the Eastern Seaboard. It is located 14.4 km south of the mouth of North Inlet Estuary. Winyah Bay drains the sub-basins of 6 major rivers, which are heavily impacted by agriculture, mining, and industry. The rivers drain approximately 46,736 km² of uplands and marshes. Descriptions of the individual monitoring sites are as follows:

Clambank Creek (CB): The Clambank Creek monitoring site is located roughly in the center of the NIW reserve. The site is surrounded by a Spartina marsh and drains associated uplands. Salinity ranges from 0 to 36. The bottom is mostly comprised of oyster shell hash and some fine sediment. This site is considered pristine and is influenced by its close proximity to the Inlet mouth.

Debidue Creek (DC): The Debidue Creek monitoring site is located in an ocean-dominated Spartina marsh that was formerly surrounded by pine-dominated uplands. The site is approximately 1 km south of the Debordieu Colony, a large development built on man-made canals that drain into the northern portion of Debidue Creek, and as a result, may be considered an impacted site. Salinity can range from 0 to 36 parts per thousand and average tidal flux is approximately 2 meters. The creek has an average depth of 2.2 m MHW and an average width of 70 m MHW at the sample site. The bottom is mostly comprised of oyster shell hash with some fine sediment and detritus.

Oyster Landing (OL): The Oyster Landing monitoring site is considered a fairly pristine and undisturbed area. Samples are collected at the end of the Oyster Landing pier from the floating dock, which is adjacent to the location of the NIW NERR weather station. The pier stretches into the upper reaches of Crab Haul Creek in the mid-western portion of North Inlet and is approximately 2.8 km from the headwaters of Crab Haul Creek. The creek drains pine forested uplands and wetlands. Salinity can range from 0 to 36 parts per thousand and average tidal flux is approximately 1.4 m. The creek has an average depth of ~2 m MHW and an average width of ~150m MHW at the sample site. The bottom is mostly comprised of oyster shell hash with some fine sediment and detritus.

Thousand Acre (TA): The Thousand Acre monitoring site is located in Thousand Acre marsh tidal creek, near the creek mouth. Prior to 7/19/1999, the sampling location was approximately 30 meters northeast of the west bridge of Thousand Acre marsh. Because of heavy siltation near the creek bank which caused inaccurate water quality measurements at the original site, beginning on 7/19/1999, the sampling site was moved and samples were collected at the NW corner of the west bridge, about 15 m from the mouth of the creek. At this new sampling site, creek depth is approximately 2 m MHW and creek width is approximately 10 m. The creek empties into the northeastern side of the midportion of Winyah Bay and drains the Thousand Acre Rice Field and surrounding pine forested uplands and vegetated wetlands. Salinity ranges from 0 to 26 parts per thousand and tidal flux is approximately 1m. The bottom is mostly composed of fine sediments and detritus. Georgetown, the homeport for a number of heavy industries, including a steel plant, paper mill, chemical plant, and a coal fired plant. Most are located on the southern side of Winyah Bay, 5 km upstream from the Thousand Acre site. A public sewage treatment plant, which discharges into the bay, is also located in Georgetown.

Pritchard, D.W. 1955. Estuarine circulation patterns. Proc. Am. Soc. Civ. Eng. 81(717):1-11.

Clambank Creek monitoring site: -79.1930 W, 33.3339 N

Debidue Creek monitoring site: -79.1681 W, 33.3603 N

Oyster Landing monitoring site (in Crab Haul Creek): -79.1928 W, 33.3494 N

Thousand Acre monitoring site: -79.2600 W, 33.2992 N

1.5.2 Bounding Rectangle Coordinates:

1.5.1.1 West Bounding Coordinate: -79.270

1.5.1.2 East Bounding Coordinate: -79.153

1.5.1.3 North Bounding Coordinate: 33.366

1.5.1.4 South Bounding Coordinate: 33.296

1.6 Keywords

1.6.1 Theme

1.6.1.1 Theme Keyword Thesaurus:	None
1.6.1.2 Theme Keyword:	AMMONIA
1.6.1.2 Theme Keyword:	CHEMISTRY
1.6.1.2 Theme Keyword:	CHLOROPHYLL A
1.6.1.2 Theme Keyword:	CARBON
1.6.1.2 Theme Keyword:	COASTAL
1.6.1.2 Theme Keyword:	DISSOLVED ORGANIC CARBON
1.6.1.2 Theme Keyword:	ECOSYSTEMS
1.6.1.2 Theme Keyword:	ESTUARINE
1.6.1.2 Theme Keyword:	ESTUARY
1.6.1.2 Theme Keyword:	INORGANIC SUSPENDED SOLIDS
1.6.1.2 Theme Keyword:	LONG-TERM
1.6.1.2 Theme Keyword:	LONG-TERM ECOLOGICAL RESEARCH

1.6.1.2 Theme Keyword:	LTER
1.6.1.2 Theme Keyword:	MARSH
1.6.1.2 Theme Keyword:	NERR
1.6.1.2 Theme Keyword:	NITRATE
1.6.1.2 Theme Keyword:	NITRITE
1.6.1.2 Theme Keyword:	NITROGEN
1.6.1.2 Theme Keyword:	NUTRIENT CHEMISTRY
1.6.1.2 Theme Keyword:	NUTRIENT CYCLING
1.6.1.2 Theme Keyword:	ORGANIC SUSPENDED SOLIDS
1.6.1.2 Theme Keyword:	ORTHO PHOSPHATE
1.6.1.2 Theme Keyword:	PHOSPHATE
1.6.1.2 Theme Keyword:	PHOSPHORUS
1.6.1.2 Theme Keyword:	SALINITY
1.6.1.2 Theme Keyword:	SALT MARSH
1.6.1.2 Theme Keyword:	SEDIMENTS
1.6.1.2 Theme Keyword:	SUSPENDED SEDIMENTS
1.6.1.2 Theme Keyword:	SWMP
1.6.1.2 Theme Keyword:	TIDAL CREEK
1.6.1.2 Theme Keyword:	TIDAL ELEVATION
1.6.1.2 Theme Keyword:	TIDE
1.6.1.2 Theme Keyword:	TOTAL SUSPENDED SOLIDS
1.6.1.2 Theme Keyword:	TURBIDITY
1.6.1.2 Theme Keyword:	VOLATILE SUSPENDED SOLIDS
1.6.1.2 Theme Keyword:	WATER CHEMISTRY
1.6.1.2 Theme Keyword:	WATER QUALITY
1.6.1.2 Theme Keyword:	SEDIMENT COLOR
1.6.1.2 Theme Keyword:	WATER COLOR

1.6.2 Place

1.6.2.1 Place Keyword Thesaurus:	None
1.6.2.2 Place Keyword:	CLAMBANK CREEK
1.6.2.2 Place Keyword:	COASTAL
1.6.2.2 Place Keyword:	CRAB HAUL CREEK
1.6.2.2 Place Keyword:	DEBIDUE CREEK
1.6.2.2 Place Keyword:	DEBORDIEU COLONY
1.6.2.2 Place Keyword:	EAST COAST
1.6.2.2 Place Keyword:	GEORGETOWN COUNTY
1.6.2.2 Place Keyword:	NORTH INLET
1.6.2.2 Place Keyword:	NORTH INLET-WINYAH BAY NERR
1.6.2.2 Place Keyword:	OYSTER LANDING
1.6.2.2 Place Keyword:	SOUTH CAROLINA
1.6.2.2 Place Keyword:	SOUTHEAST COAST
1.6.2.2 Place Keyword:	THOUSAND ACRE MARSH
1.6.2.2 Place Keyword:	THOUSAND ACRE MARSH TIDAL CREEK
1.6.2.2 Place Keyword:	THOUSAND ACRE RICE FIELD
1.6.2.2 Place Keyword:	USA
1.6.2.2 Place Keyword:	WINYAH BAY

1.6.3 Stratum

1.6.3.1 Stratum Keyword Thesaurus:	None
1.6.3.2 Stratum Keyword:	WATER COLUMN
1.6.3.2 Stratum Keyword:	SURFACE WATERS

1.6.4 Temporal

1.6.4.1 Temporal Keyword Thesaurus:	None
1.6.4.2 Temporal Keyword:	1993
1.6.4.2 Temporal Keyword:	1994
1.6.4.2 Temporal Keyword:	1995
1.6.4.2 Temporal Keyword:	1996
1.6.4.2 Temporal Keyword:	1997

1.6.4.2 Temporal Keyword:	1998
1.6.4.2 Temporal Keyword:	1999
1.6.4.2 Temporal Keyword:	2000
1.6.4.2 Temporal Keyword:	2001
1.6.4.2 Temporal Keyword:	1993-2001
1.6.4.2 Temporal Keyword:	1990s
1.6.4.2 Temporal Keyword:	2000s

1.7 Access Constraints:

None; however, it is strongly recommended that these data be directly acquired from the Belle W. Baruch Institute for Marine Biology and Coastal Research and not indirectly through other sources which may have changed the data in some way.

1.8 Use Constraints:

Following academic courtesy standards, the PIs (originators), the North Inlet – Winyah Bay NERR site, the University of South Carolina's Belle W. Baruch Institute for Marine Biology and Coastal Research, and Grantor (see Data Set Credit section) should be fully acknowledged in any subsequent publications in which any part of these data are used. Use of the data without completely reading and understanding the metadata is not recommended. The Baruch Institute, Baruch Institute researchers, and Grantor are not responsible for the use and/or misuse of data from this database. See the section on Distribution Liability for more information.

1.9 Point of Contact:

10.2 Contact Organization Primary

10.2.1 Contact Organization:	Univ. of South Carolina's Baruch Institute
10.2.2 Contact Person:	Ginger Ogburn-Matthews
10.3 Contact Position:	Research Data Manager & Analyst

10.4 Contact Address

10.4.1 Address Type:	Mailing Address
10.4.2 Address:	USC Baruch Marine Field Laboratory
10.4.2 Address:	P.O. Box 1630
10.4.3 City:	Georgetown
10.4.4 State or Province:	South Carolina
10.4.5 Postal Code:	29442
10.4.6 Country:	USA

10.5 Contact Voice Telephone: (843) 546-6219

10.7 Contact Facsimile Telephone: (843) 546-1632

10.8 Contact Electronic Mail Address: ginger@belle.baruch.sc.edu

10.9 Hours of Service: 8:30 am to 4:30 pm Mon.- Friday

1.11 Data Set Credit:

Data collection has been supported by the University of South Carolina (USC) and the National Oceanic & Atmospheric Administration (NOAA) through the Office of Ocean and Coastal Resource Management, Estuarine Reserves Division (initial award number NA270R0322-01 October 15, 1992). The North Inlet – Winyah Bay National Estuarine Research Reserve, overseen by USC's Belle W. Baruch Institute for Marine Biology and Coastal Research, is in charge of gathering, managing, and distributing these data for research, education, and coastal zone management purposes. Several researchers, technicians, and data managers contributed to the dataset.

1.14 Native Data Set Environment

Data were entered into Microsoft Excel spreadsheets or workbooks. Processing of the data occurred either within MS Excel spreadsheets or with the use of SAS (Statistical Analysis System) programs. Final data are maintained in Microsoft Excel 2000 and duplicates are saved in comma delimited text (.csv) format. Some process files are also available in .csv format.

1.14 Cross Reference:

8. Citation Information:

8.1 Originator: Elizabeth Blood (Daily Estuarine Surface Water Nutrient Chemistry and Water Quality Data)

8.1 Originator: Leonard Robert Gardener (Suspended Sediments)
 8.1 Originator: Richard Zingmark (Phytoplankton Biomass - Chlorophyll a and Phaeophytin)
 8.1 Originator: Belle W. Baruch Institute for Marine Biology and Coastal Research
 8.2 Publication Date: 19981120
 8.4 Title: Long Term Ecological Research (LTER) Daily Estuarine Surface Water Nutrient and Water Quality, Suspended Sediment, and Chlorophyll a Data for the North Inlet Estuary, Georgetown, SC: 1978-1993
 8.5 Edition: First Edition
 8.6 Geospatial Data Presentation Form: comma delimited digital data and spreadsheet
 8.7 Series Information:
 8.7.1 Series Name: Baruch Institute's Water Chemistry, Chlorophyll a, and Suspended Sediment Long-Term Monitoring Database for the North Inlet Estuary, South Carolina
 8.7.2 Issue Identification: September 1, 1978 - June 30, 1993
 8.8 Publication Information:
 8.8.1 Publication Place: Georgetown, South Carolina USA
 8.8.2 Publisher: Belle W. Baruch Institute for Marine Biology and Coastal Research, University of South Carolina
 8.10 Online Linkage: <http://links.baruch.sc.edu/data/>

1.15 Cross Reference:

8. Citation Information:

8.1 Originator: Belle W. Baruch Institute for Marine Biology and Coastal Research
 8.1 Originator: North Inlet - Winyah Bay (NIW) National Estuarine Research Reserve
 8.1 Originator: D. Allen
 8.1 Originator: A. Lohrer
 8.2 Publication Date: 20021111
 8.4 Title: North Inlet - Winyah Bay (NIW) National Estuarine Research Reserve Meteorological Data, North Inlet Estuary, Georgetown, South Carolina: 2001.
 8.6 Geospatial Data Presentation Form: MS Access database and tab-delimited text (spreadsheet)
 8.8 Publication Information:
 8.8.1 Publication Place: Georgetown, South Carolina
 8.8.2 Publisher: NERR Centralized Data Management Office
 8.10 Online Linkage: <http://cdmo.baruch.sc.edu>
 8.11 Larger Work Citation:
 8. Citation Information:
 8.1 Originator: National Oceanic and Atmospheric Administration (NOAA)
 8.1 Originator: Office of Ocean and Coastal Resource Management (OCRM)
 8.1 Originator: National Estuarine Research Reserve System (NERR)
 8.2 Publication Date: 2002
 8.4 Title: NERR System-Wide Monitoring Program (SWMP)
 8.6 Geospatial Data Presentation Form: tab-delimited text (spreadsheet)
 8.8 Publication Information:
 8.8.1 Publication Place: Georgetown, South Carolina
 8.8.2 Publisher: NERR Centralized Data Management Office
 8.10 Online Linkage: <http://cdmo.baruch.sc.edu>

1.14 Cross Reference:

8. Citation Information:

8.1 Originator: Belle W. Baruch Institute for Marine Biology and Coastal Research
 8.1 Originator: North Inlet - Winyah Bay (NIW) National Estuarine Research Reserve
 8.1 Originator: D. Allen
 8.1 Originator: A. Lohrer
 8.2 Publication Date: Unpublished material
 8.4 Title: North Inlet - Winyah Bay (NIW) National Estuarine Research Reserve Meteorological Data, North Inlet Estuary, Georgetown, South Carolina: 2000.
 8.6 Geospatial Data Presentation Form: MS Access database and tab-delimited text (spreadsheet)
 8.11 Larger Work Citation:
 8. Citation Information:
 8.1 Originator: National Oceanic and Atmospheric Administration (NOAA)
 8.1 Originator: Office of Ocean and Coastal Resource Management (OCRM)
 8.1 Originator: National Estuarine Research Reserve System (NERR)
 8.2 Publication Date: 2001

- 8.4 Title: NERR System-Wide Monitoring Program (SWMP)
- 8.6 Geospatial Data Presentation Form: tab-delimited text (spreadsheet)
- 8.8 Publication Information:
 - 8.8.1 Publication Place: Georgetown, South Carolina
 - 8.8.2 Publisher: NERR Centralized Data Management Office URL: <http://cdmo.baruch.sc.edu>

1.14 Cross Reference:

8. Citation Information

- 8.1 Originator: Belle W. Baruch Institute for Marine Biology and Coastal Research
- 8.1 Originator: North Inlet – Winyah Bay (NIW) National Estuarine Research Reserve
- 8.1 Originator: D. Allen
- 8.1 Originator: E. Chipouras
- 8.2 Publication Date: 20020701
- 8.4 Title: North Inlet – Winyah Bay (NIW) National Estuarine Research Reserve Meteorological Data, North Inlet Estuary, Georgetown, South Carolina: 1997 – 1999.
- 8.6 Geospatial Data Presentation Form: comma delimited text and spreadsheet
- 8.8 Publication Information:
 - 8.8.1 Publication Place: Belle W. Baruch Marine Field Laboratory, Georgetown, South Carolina, USA
 - 8.8.2 Publisher: The Belle W. Baruch Institute for Marine Biology and Coastal Research, Baruch Marine Field Lab, University of South Carolina
- 8.10 Online Linkage: <http://links.baruch.sc.edu/data/>
- 8.11 Larger Work Citation:
 - 8. Citation Information:
 - 8.1 Originator: National Oceanic and Atmospheric Administration (NOAA)
 - 8.1 Originator: Office of Ocean and Coastal Resource Management (OCRM)
 - 8.1 Originator: National Estuarine Research Reserve System (NERR)
 - 8.2 Publication Date: 2002
 - 8.4 Title: NERR System-Wide Monitoring Program (SWMP)
 - 8.6 Geospatial Data Presentation Form: tab-delimited text (spreadsheet)
 - 8.8 Publication Information:
 - 8.8.1 Publication Place: Georgetown, South Carolina
 - 8.8.2 Publisher: NERR Centralized Data Management Office URL: <http://cdmo.baruch.sc.edu>

1.14 Cross Reference:

8. Citation Information:

- 8.1 Originator: Belle W. Baruch Institute for Marine Biology and Coastal Research
- 8.1 Originator: D. Allen
- 8.1 Originator: Joe Schubauer-Berigan
- 8.2 Publication Date: unpublished material
- 8.4 Title: Best Management Practice Study for Two Golf Courses in Georgetown County: 1995-1997
- 8.6 Geospatial Data Presentation Form: comma delimited digital data and spreadsheet

2. Data Quality Information

2.1 Attribute Accuracy

2.1.1 Attribute Accuracy Report:

Analytical Quality Control:

Various control measures are taken to monitor the operation of the Technicon AutoAnalyzers. Triplicate standards are run at the beginning of each tray of samples and these must fall within a specified range for that particular chemistry. Five blanks are prepared and analyzed to determine the level of contamination of the oxidizing reagent used in each batch of total nitrogen and total phosphorus samples. These blanks are run in duplicate and the average value is used as a correction for that batch of total samples.

Additional control measures are used with the Carbon Analyzer, the Fluorometer, and the Analytical Balance. Samples analyzed for dissolved organic carbon (DOC) on the Shimadzu TOC-500 Carbon Analyzer are run in triplicate and means are reported. Chlorophyll *a* values are determined by standard method of Fluorometric Analysis. The fluorometer is calibrated by running standard curves (using chlorophyll *a* standard purchased from Sigma), which are then used to generate correction equations. Concentration of the standard is confirmed by spectrophotometric analysis. Finally, all recorded sediment weights are determined using a four-place Analytical Balance with a standard deviation of (+/-) 0.1 mg.

2.1.2 Quantitative Attribute Accuracy Assessment

2.1.2 .1 Attribute Accuracy Value

Time	± 5 minutes
Total Nitrogen Whole (TNW)	± 1 micromole per liter*
Total Nitrogen Filtered (TNF)	± 1 micromole per liter*
Total Phosphorus Whole (TPW)	± 1 micromole per liter*
Total Phosphorus Filtered (TPF)	± 1 micromole per liter*
Ortho phosphate (OP)	± 0.1 micromoles per liter*
Ammonia (NH ₄)	± 0.1 micromoles per liter*
Nitrate-Nitrite (NN)	± 0.1 micromoles per liter*
Dissolved Organic Carbon (DOC)	± 0.1 milligrams per liter
Total Suspended Sediments (TSS)	± 0.001 grams per liter (± 1 milligram per liter)
Inorganic Suspended Sediments (ISS)	± 0.001 grams per liter (± 1 milligram per liter)
Organic Suspended Sediments (OSS)	± 0.001 grams per liter (± 1 milligram per liter)
Chlorophyll a (Chl a)	± 0.1 micrograms per liter (µg/l)
Salinity	± 2 parts per thousand

* [micromoles per liter = microgram atoms per liter]

<u>Parameter</u>	<u>Number of Decimal Places</u>
TNW	1
TNF	1
TPW	1
TPF	1
OP	2
NH ₄	2
NN	2
DOC	1
TSS	1
ISS	1
OSS	1
CHLA	2
SAL	0

2.1.2.2 Attribute Accuracy Explanation:

Time: The Eastern Standard Time that the sample was taken in hh:mm format. Time is generally considered to be accurate to within plus or minus 5 minutes.

TNW, TNF, TPW, and TPF: The Technicon Autoanalyzer used for these analyses can read values to an accuracy of three decimal places. However, due to error introduced through the handling of water samples, processing of samples, and the potential for variation and minor contamination of the oxidizing reagent, the actual accuracy is only plus or minus 1 micromole per liter. As a result, the measurements (reported in micromoles per liter) are given with only one decimal place.

OP, NH₄, and NN: The Technicon Autoanalyzer is also used for these analyses, but the handling and processing of these nutrients leaves less room for error and, as a result, the measurements are more accurate. The measurements (reported in micromoles per liter) are given with two decimal places.

DOC: The Shimadzu Carbon analyzer reads to the nearest one hundredth, but because the final value is an average of three values, it is reported to the nearest tenth of a milligram/liter (one decimal place).

TSS ISS OSS: The balance used for these parameters reads to ten thousandths of a gram (four decimal places), but because humidity in the air can influence the weight of the filters, the measurements are only assumed accurate to one thousandth of a gram (3 decimal places), or one milligram. The values are reported in the database to the nearest tenth of a milligram/liter (one decimal place).

CHLA: Strickland and Parsons (1977) say that chlorophyll a detection limits depend on the volume filtered and the sensitivity of the fluorometer. Using a Turner fluorometer (presumably similar to the one in the NERR Water Chemistry project), their accuracy limit documentation states a limit of 0.01 micrograms/liter when 2 liters were filtered. Because we filter 10-20 milliliters, the accuracy would be much less. We are estimating that our chlorophyll accuracy is 0.1 micrograms/liter at best. No tests have been done to verify this. Measurements are reported in micrograms/liter with two decimal places in the database.

SAL: The refractometer used to determine salinity reads to the nearest part per thousand; but is only accurate to within 2 parts per thousand. The measurements are reported in parts per thousand with no decimal places in the database.

TIDE EL: Tide elevations were recorded for each sample based on NOAA tide charts for Charleston, SC's predicted tide times. For the Winyah Bay site (TA) one hour and 30 minutes were added to this time to compensate for the lag in the tide between locations.

Strickland, J.D.H., and T.R. Parsons. 1972. A Practical Handbook of Seawater Analysis, Seconded. Ottawa: Fisheries Research Board of Canada. 309pp.

2.2 Logical Consistency Report:

Negative calculated values for total nitrogen & total phosphorus (TNW, TNF, TPW, TPF) can occur. These negative values are not generated by the Technicon Autoanalyzer. Negative values are the result of mathematical manipulation of the raw values. Very low values approaching the lower detection limit should be suspect and considered zero values. The actual negative values should be viewed as an indicator of the range of error involved in the method for analysis.

Negative values can occur for one or a combination of the following reasons:

- 1) The nutrient concentration of the sample approaches the minimum detection limit of the technique – the assumption is that the baseline drift on the technicon is both linear & incremental
- 2) Errors were incurred during the preparation of the samples for analysis
- 3) Subtraction of the oxidation reagent blank from the very low total nutrient concentration

These values are reported as negative values in the final data set, they are not changed to zero.

2.3 Completeness Report:

The MS Excel data file is verified for typographical errors by the Data Manager. Missing data values are represented by periods. The following table gives general data availability information for the database by sampling site. There may be missing data within these date ranges.

Oyster Landing (OL): June 2, 1993 – December 18, 2001

Thousand Acre (TA): April 18, 1994 – December 18, 2001

Clambank Creek (CB): June 2, 1993 – December 30, 1995 and August 19, 2001 – December 18, 2001

Debidue Creek (DC): March 8, 1998 – December 18, 2001

Missing Data:

Clambank Creek:

6/2/1993 at 18:32:	No water sample taken
11/4/1994 at 20:20:	No water sample taken
12/29/1995 at 16:13:	No water sample taken, battery malfunction due to cold
12/29/1995 at 18:17:	No water sample taken, battery malfunction due to cold
12/29/1995 at 20:21:	No water sample taken, battery malfunction due to cold
12/29/1995 at 22:25:	No water sample taken, battery malfunction due to cold
12/30/1995 at 00:29:	No water sample taken, battery malfunction due to cold
12/30/1995 at 02:33:	No water sample taken, battery malfunction due to cold
12/30/1995 at 04:37:	No water sample taken, battery malfunction due to cold
12/30/1995 at 06:41:	No water sample taken, battery malfunction due to cold
12/30/1995 at 08:45:	No water sample taken, battery malfunction due to cold
11/18/1999-4/22/2001:	No CHLA data; data removed from database due to malfunction of fluorometer
8/19/2001 at 20:24:	No water sample taken

Debidue Creek:

5/7/1998 at 11:06:	No water sample taken
1/2/1999 at 09:49:	No water sample taken
1/2/1999 at 11:53:	No water sample taken
1/2/1999 at 13:57:	No water sample taken
1/2/1999 at 16:01:	No water sample taken
1/2/1999 at 18:05:	No water sample taken
1/2/1999 at 22:13:	No water sample taken
1/3/1999 at 00:17:	No water sample taken
1/3/1999 at 02:21:	No water sample taken

5/2/1999 – 5/3/1999: No water sample taken for the entire sampling event
5/22/1999 at 09:58: No CHLA data recorded
5/22/1999 at 12:02: No CHLA data recorded
5/22/1999 at 14:06: No CHLA data recorded
8/10/1999– 8/11/1999: No water sample taken for the entire sampling period, except for sample #1
11/18/1999 at 21:41: No water sample taken
11/18/1999-4/22/2001: No CHLA data; data removed from database due to malfunction of fluorometer

Oyster Landing:

12/29/1995 – 12/30/1995: No water sample taken for the entire sampling event, battery dead due to cold
5/12/1997 – 5/13/1997: No water sample taken for the entire sampling event, battery malfunction
1/2/1999 – 1/3/1999: No water sample taken for the entire sampling event
11/18/1999-4/22/2001: No CHLA data; data removed from database due to malfunction of fluorometer

Thousand Acre:

5/8/1994 at 07:53: No data recorded for CHLA
1/3/1995 at 10:58: No data recorded for TPW, TPF, TNW, and TNF
12/29/1995 at 19:47: No water sample taken, battery malfunction due to cold
12/29/1995 at 21:51: No water sample taken, battery malfunction due to cold
12/29/1995 at 23:55: No water sample taken, battery malfunction due to cold
12/30/1995 at 01:59: No water sample taken, battery malfunction due to cold
12/30/1995 at 04:03: No water sample taken, battery malfunction due to cold
12/30/1995 at 06:07: No water sample taken, battery malfunction due to cold
12/30/1995 at 08:11: No water sample taken, battery malfunction due to cold
12/30/1995 at 10:15: No water sample taken, battery malfunction due to cold
2/7/1996 at 06:56: No water sample taken
7/16/1996 at 18:08: No data recorded for TNW or TPW
8/26/1996 at 12:48: No data recorded for TNW or TPW
10/5/1996 at 07:14: No water sample taken, battery malfunction
10/5/1996 at 09:18: No water sample taken, battery malfunction
8/20/1997 at 21:04: No water sample taken, autosampler malfunction
8/20/1997 at 23:08: No water sample taken, autosampler malfunction
8/21/1997 at 01:12: No water sample taken, autosampler malfunction
8/21/1997 at 03:16: No water sample taken, autosampler malfunction
8/21/1997 at 05:20: No water sample taken, autosampler malfunction
3/8/1998 at 16:19: No water sample taken
3/8/1998 at 18:23: No water sample taken
3/8/1998 at 20:27: No water sample taken
3/8/1998 at 22:31: No water sample taken
3/9/1998 at 00:35: No water sample taken
3/9/1998 at 02:39: No water sample taken
3/9/1998 at 04:43: No water sample taken
3/9/1998 at 06:47: No water sample taken
3/9/1998 at 08:51: No water sample taken
3/9/1998 at 10:55: No water sample taken
3/9/1998 at 12:59: No water sample taken
7/6/1998 – 7/7/1998: No water sample taken for the entire sampling event
5/2/1999 – 5/3/1999: No water sample taken for the entire sampling event
11/18/1999-4/22/2001: No CHLA data; data removed from database due to malfunction of fluorometer
6/5/2000 at 09:49: No water sample taken
6/5/2000 at 11:53: No water sample taken
6/5/2000 at 13:57: No water sample taken
6/5/2000 at 16:01: No water sample taken
6/5/2000 at 18:05: No water sample taken
6/5/2000 at 20:09: No water sample taken
6/5/2000 at 22:13: No water sample taken
6/6/2000 at 00:17: No water sample taken
6/6/2000 at 02:21: No water sample taken
6/6/2000 at 04:25: No water sample taken
6/6/2000 at 06:29: No water sample taken

1/11/2001 at 06:16:	No water sample taken
1/11/2001 at 08:20:	No water sample taken
1/11/2001 at 22:48:	No water sample taken
1/12/2001 at 00:52:	No water sample taken
1/12/2001 at 02:56:	No water sample taken
1/12/2001 at 05:00:	No water sample taken

Anomalous Data:

Baruch's Data Manager has designated the following data as questionable. We recommend that these data be used with caution. Any data determined to be erroneous have been removed from the dataset and are noted in this report.

All chlorophyll a data for the following dates were determined to be erroneous and removed. See the Supplemental Information section for more details.

CHLA for all sites: **11/18/1999 – 4/22/2001**

Clambank Creek:

TPW (12.8) on **7/27/1994**, event #22, sample #10, at 23:25 on a SH tide. This value is very high for the parameter relative to the typical measurements taken at this site. The Data Manager found no evidence of typographical or laboratory error, and as a result, it is possible that the measurement is valid.

CHLA on **7/27/1994** and **7/28/1994**, event #22. Chlorophyll data for this event are suspect as a result of the filter combination used with the fluorometer (see Process Description). The Data Manager found these values to be fairly high, but the values for the following sampling period (on 8/16/1994) were even higher. For this reason, the measurements were left in the data set, however, they should be used with caution.

Debidue Creek:

NH4 (11.9) on **2/20/2001**, event #142, sample #1, at 12:17 pm a SL tide. This value is very high for the parameter relative to the typical measurements taken at this site. All of the subsequent samples measured during this event were 0.0, except for #12, which had a value of 0.1. Both this extreme change in readings and the consistent 0.0 measurements over a sample event are unusual. The entire sample event is questionable, however, since the Data Manager found no evidence of typographical or laboratory error, it is possible that the measurements are valid.

Oyster Landing:

CHLA on **7/27/1994** and **7/28/1994**, event #22. Chlorophyll data for this event are suspect as a result of the filter combination used with the fluorometer (see Process Description). The Data Manager found these values to be fairly high, but the values for the following sampling period (on 8/16/1994) were even higher. For this reason, the measurements were left in the data set, however, they should be used with caution.

NH4 (38.0) on **8/16/1994**, event #23, sample #1, at 9:17 on a SL tide. This value is very high for the parameter relative to the typical measurements taken at this site. The Data Manager found no evidence of typographical or laboratory error, and as a result, it is possible that the measurement is valid.

NH4 (33.1) on **3/24/1995**, event #34, sample #7, at 20:37 on a SL tide. This value is very high for the parameter relative to the typical measurements taken at this site. The Data Manager found no evidence of typographical or laboratory error, and as a result, it is possible that the measurement is valid.

TNW (199.9) on **9/4/1998**, event #97, sample #1, at 11:58 on a SL tide. This value is very high for the parameter relative to the typical measurements taken at this site. The Data Manager found no evidence of typographical or laboratory error, and as a result, it is possible that the measurement is valid.

Thousand Acre:

TNW (388.9), **TSS** (1033.3), **ISS** (857.3), and **OSS** (176.0) on **7/27/1994**, event #22, sample #7, at 18:43 on a SL tide. These values are all very high for the parameters relative to the typical measurements taken at this site. However, since they do all correspond and there was no evidence of typographical or laboratory error found by the Data Manager, it is possible that the measurements are valid.

CHLA on **7/27/1994** and **7/28/1994**, event #22. Chlorophyll data for this event are suspect as a result of the filter combination used with the fluorometer (see Process Description). The Data Manager found these values to be fairly high,

but the values for the following sampling period (on 8/16/1994) were even higher. For this reason, the measurements were left in the data set, however, they should be used with caution.

TNW (329.4) on **8/17/1994**, event #23, sample #13, at 11:35 on a SL tide. This is a very high value for the parameter relative to the typical measurements at this site. However, since the Data Manager found no evidence of typographical or laboratory error, it is possible that the measurement is valid.

NN (69.9) on **10/4/1996**, event #62, sample #1, at 8:30 on a SL tide.
NN (58.7) on **10/4/1996**, event #62, sample #2, at 10:34 on a FL tide.
NN (70.3) on **10/4/1996**, event #62, sample #3, at 12:38 on a FH tide.
NN (69.1) on **10/4/1996**, event #62, sample #4 at 14:42 on a SH tide.
NN (66.5) on **10/4/1996**, event #62, sample #5 at 16:46 on a EH tide.
NN (51.2) on **10/4/1996**, event #62, sample #6, at 18:50 on a EL tide.
NN (61.3) on **10/4/1996**, event #62, sample #9, at 1:02 on a FH tide.
NN (66.4) on **10/4/1996**, event #62, sample #10, at 3:06 on a SH tide.
NN (64.0) on **10/4/1996**, event #62, sample #11, at 5:10 on a EH tide.

These values are all very high for the parameter relative to the typical measurements taken at this site. Nearly the entire sampling event registered abnormally high values for NN, with the exception of samples #7 and #8, which appeared “normal”. Samples #12 and #13 are missing from the data set completely for all parameters. The high values occurred over the full tide cycle; tide did not seem to have a major affect on the measurements. The Data Manager found no evidence of typographical or laboratory error; it is possible that the measurements are valid.

TPW (26.9) on **1/7/1998**, event #85, sample #3, at 15:00 on a FH tide. This is a very high value for the parameter relative to the typical measurements at this site. However, since the Data Manager found no evidence of typographical or laboratory error, it is possible that the measurement is valid. The **TNW** value for this sample is also high, although the difference from typical **TNW** measurements is less dramatic than the **TPW**. See the following **TSS**, **OSS**, and **ISS** anomalous data information as well.

TSS (64.0), **ISS** (45.7), and **OSS** (18.3) on **1/7/1998**, event #85, sample #1, at 10:52 on a SL tide.
TSS (39.5), **ISS** (27.5), and **OSS** (12.0) on **1/7/1998**, event #85, sample #2, at 12:56 on a FL tide.
TSS (586.7), **ISS** (470.7), and **OSS** (116.0) on **1/7/1998**, event #85, sample #3, at 15:00 on a FH tide.
TSS (268.0), **ISS** (56.0), and **OSS** (212.0) on **1/7/1998**, event #85, sample #4, at 17:04 on a SH tide.
TSS (252.0), **ISS** (246.7), and **OSS** (5.3) on **1/7/1998**, event #85, sample #5, at 19:08 on a EH tide.
TSS (99.0), **ISS** (114.0), and **OSS** (-15.0) on **1/7/1998**, event #85, sample #6, at 21:12 on a EL tide.
TSS (44.8), **ISS** (64.8), and **OSS** (-20.0) on **1/7/1998**, event #85, sample #7, at 23:16 on a SL tide.
TSS (616.0), **ISS** (504.0), and **OSS** (112.0) on **1/7/1998**, event #85, sample #8, at 1:20 on a FL tide.
TSS (513.3), **ISS** (408.3), and **OSS** (105.0) on **1/7/1998**, event #85, sample #9, at 3:24 on a FH tide.
TSS (276.7), **ISS** (218.3), and **OSS** (58.3) on **1/7/1998**, event #85, sample #10, at 5:28 on a SH tide.
TSS (231.7), **ISS** (180.0), and **OSS** (51.7) on **1/7/1998**, event #85, sample #11, at 7:32 on a EH tide.
TSS (146.7), **ISS** (110.7), and **OSS** (36.0) on **1/7/1998**, event #85, sample #12, at 9:36 on a EL tide.
TSS (122.7), **ISS** (92.0), and **OSS** (30.7) on **1/7/1998**, event #85, sample #13, at 11:40 on a SL tide.

Measurements during this period for all parameters exhibited a great deal of variability and some unusually high and low values. The negative **OSS** values in particular seem difficult to believe. In checking for errors in calculation, the Data Manager determined that the recorded oxidized weight for the two samples with negative **OSS** values (#6 and #7) were actually higher than the total weights, which is only possible as a result of laboratory or recording error. After further investigation it was determined that the laboratory technician had difficulty filtering a large enough volume of sample for the entire sample event. This indicates that there may have been a large amount of sediment sucked into the sampling mechanism. A possible explanation is that the automated sampler was located on or near the sediment during sampling. As a result, the Data Manager chose to highlight all of these measurements as anomalous and possibly erroneous. In addition, the **TPW** measurement noted above was also unusually high for at least one sample during this same sample event. This could indicate that other parameters were also affected during the event.

NH4 (40.8) on **7/26/1998**, event #95, sample #1, at 5:08 on SL tide.
NH4 (42.7) on **7/26/1998**, event #95, sample #7, at 17:32 on SL tide.

These are very high values for the parameter relative to the typical measurements at this site. They do not appear to correspond to elevated measurements of any other parameters but do both occur at a SL tide. The Data Manager found no evidence of typographical or laboratory error; it is possible that the measurements are valid.

TPW (17.0), **TPF** (11.9), and **OP** (10.57) on **12/2/2000**, event #138, sample #1, at 7:08 on a SL tide.

TPW (11.9), **TPF** (10.6), and **OP** (8.53) on **12/2/2000**, event #138, sample #7, at 19:32 on a SL tide.

TPW (11.1), **TPF** (9.6), and **OP** (7.88) on **12/2/2000**, event #138, sample #13, at 7:56 on a SL tide.

These values are all very high for the parameters relative to the typical measurements taken at this site. They are attributed to a prescribed burn of interior upland pine forest that occurred on 11/30/2000. All of the dramatically high values occurred at slack low tide, as would be expected if they were a result of runoff associated with the burned portion of the property. Although only the highest values are noted here as anomalous, it is possible that the prescribed burn also affected other measurements taken for these and other parameters during this sampling period. Another burn took place in the marsh and upland area to the northwest side of the TA sampling site on 1/28/2001. The **NH4** measurements appear to be elevated during SL tide in particular during sample events #139 and #140 (late December 2000 and early January 2001), but are not so elevated as to be considered anomalous. These values are likely a delayed result of the fire. In addition, it is also possible that elevated measurements taken for these parameters in earlier years were also a result of prescribed burns, and that the correlation was only realized and documented in 2000.

2.5 Lineage

2.5.1 Methodology

2.5.1.1 Methodology Type: Field Collection Procedures and Protocols

2.5.1.3 Methodology Description: Overall Field Collection Protocol

1000 ml (one Liter) samples were collected every 20 days at 2 hour and 4 minute intervals, for 2 complete tidal cycles (26 hours), with an ISCO automated water sampler at a depth of 0.5 meters below the water's surface. Because the LTERDWS water sampling collections were taken every day at 10:00am EST, it was determined that the nutrient data were biased for Spring high tides; not all tides levels would be represented. "The complex interaction of a daily temporally fixed sampling design with seasonal, tidal, and diurnal cycles can result in serious aliasing and reduced usefulness of estuarine data" (Hutchinson and Sklar, 1993). The new NERRWCHEM sampling protocols "takes into account both solar and lunar influences and their interactions in order to represent actual estuarine conditions". It was determined that a 10 day sampling cycle (or multiples of 10) would represent all tidal stages when run over the years. A 20-day schedule was selected for the NERRWCHEM project because if a 10-day interval was chosen, the water technician could not process all the sites samples in a timely fashion, and a 30 day schedule did not produce enough data points for the year.

Justification for use of the autosampler technique can be found in the 1992 Calibration Study Ancillary Data. {During this study comparisons were made between the water chemistry results obtained from the LTER DWS and the proposed NERRWCHEM sampling protocols. There were no significant differences observed between the two methods, except for an increase in sediment load found in the autosampler samples.} In the NERRWCHEM: all sampling periods start and end at low tide. The start times for sites located in the North Inlet Estuary are the predicted low tide times (EST) from the NOAA tide chart for Charleston, South Carolina. The start times for the Winyah Bay site (TA) are the predicted low tide times from the tide chart plus one hour and 30 minutes (the calculated lag time between North Inlet and Thousand Acre based on water quality data logger water level data). Sampling sites included Oyster Landing (OL), Thousand Acre (TA), Clambank Creek (CB), and Debidue Creek (DC) over the course of the database (see the Description of Geographic Extent section for more information on the sample sites). Only the OL site was sampled throughout the entire database, beginning on June 2, 1993 through December of 2001.

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: Steve E. Hutchinson

8.1 Originator: Fred H. Sklar

8.2 Publication Date: 1993

8.4 Title: Lunar Periods as Grouping Variables for Temporally Fixed Sampling Regimes in a Tidally Dominated Estuary

8.6 Geospatial Data Presentation Form: Published Manuscript

8.8 Publication Information:

8.8.1 Publication Place: Belle W. Baruch Institute for Marine Biology and Coastal Research, University of South Carolina, Columbia, SC.

8.8.2 Publisher: Estuaries

8.9 Other Citation Details: Volume 16, Number 4, pages 789-798

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Overall Laboratory Protocol

Samples were generally processed within a 48 hours of collection. Salinity values were determined using a hand-held refractometer in the laboratory. Seventy-five to 500 ml of the water samples were filtered through a preweighed, precombusted Whatman GFF 0.7 micrometer (nominal pore size) glass fiber filter to separate the particulates from the dissolved portion of

the sample. Samples were shaken before filtering began; the amount of water filtered was determined by how much sediment and other solids were in the sample. During the winter, in the absence of phytoplankton blooms and when sedimentation was low, up to 500 ml of sample were filtered. During the summer, especially after periods of heavy rains, it wasn't possible to filter such a large volume. The determining factor in the amount of water filtered was the amount necessary to obtain a good sample of suspended solids on the filter, in order to get beyond the minimum detection limits of the TSS analysis.

The filtered aliquots for TNF, TPF, NN, OP, and NH₄, and non-filtered aliquots (or what remained on the 0.7 micrometer filter) for TNW and TPW, were analyzed with a Technicon AutoAnalyzer. Filtered aliquots were also used for DOC analysis with a Shimadzu Carbon Analyzer. Non-filtered samples were used in the Sequoia-Turner Fluorometer for chlorophyll a analysis and for the TSS, ISS, and OSS analyses.

The Technicon and the Carbon Analyzer produced output printouts with raw nutrient value concentrations and DOC values. With the Technicon model used for this database, there were no peak heights (as there were for the LTERDWS database); the technicon converted the peak heights directly into a nutrient concentration. Results from all other analyses were recorded by hand.

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: Patricia M. Glibert

8.1 Originator: Theodore C. Loder

8.2 Publication Date: 197706

8.4 Title: Automated Analysis of Nutrients in Seawater: A Manual of Techniques

8.5 Edition: Publication Number WHOI-77-47

8.6 Geospatial Data Presentation Form: Manual

8.8 Publication Information:

8.8.1 Publication Place: Woods Hole, Massachusetts 02543

8.8.2 Publisher: Woods Hole Oceanographic Institution

8.9 Other Citation Details: Unpublished Manuscript supported by Ocean Industry Program of the Woods Hole Oceanographic Institution

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Total Nitrogen - Total Phosphorus (TNW, TNF, TPW, TPF)

Non-filtered water samples were used in the procedure to determine TNW and TPW concentrations. The filtrate (less than 0.7 micrometers) was used in the procedure to determine the TNF and TPF concentrations. The TN & TP method is a combination of two methods listed below, but in general the procedure consists of an alkaline persulfate oxidation followed by automated analysis for nitrogen (as nitrate) and phosphorus (as phosphate) on a Technicon AutoAnalyzer. Oxidation reagent blanks (ORB) are run with each batch of persulfate digestion reagents.

With alkaline persulfate digestion, all nitrogen in the sample was oxidized to nitrate, which was then reduced by cadmium and analyzed as nitrite. The precision and recovery of this method compared favorably with a Kjeldahl procedure (D'Elia et al., 1977). The main advantage of the persulfate oxidation is the speed and convenience with which it was accomplished. Unlike the Kjeldahl method, which recovered only organic and NH₄ - nitrogen, the persulfate oxidation also included NO₃ and NO₂ nitrogen.

This semi-automated procedure combines the persulfate oxidation with automated nitrate and phosphate analysis to provide simultaneous analysis for total persulfate nitrogen (TPN) and total persulfate phosphorus (TTP) (Glibert et al., 1977). Glibert's procedure has been further modified to use smaller sample sizes, so that the digestion flask can double as the sampler tray cup (Loder 1978). With this method, many samples can be run quickly with a minimum of handling.

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: C.F. D'Elia

8.1 Originator: P.A. Steudler

8.1 Originator: N. Corwin

8.2 Publication Date: 1977

8.4 Title: Determination of Total Nitrogen in Aqueous Samples Using Persulfate Digestion.

8.6 Geospatial Data Presentation Form: Unpublished Manuscript

8.8 Publication Information:

8.8.1 Publication place: unknown

8.8.2 Publisher: Limnol. Oceanography

8.9 Other Citation Details: Volume 22: pp. 760-764

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: P.M. Glibert

8.1 Originator: Z. Mlodzinska

8.1 Originator: C.F. D'Elia

8.2 Publication Date: 1977

8.4 Title: A Semi-automated Persulfate Oxidation Technique for Simultaneous Total Nitrogen and Total Phosphorus Determination in Natural Water Samples

8.6 Geospatial Data Presentation Form: Scientific paper

8.8 Publication Information:

8.8.1 Publication Place: Woods Hole, Massachusetts 02543

8.8.2 Publisher: Ocean Industry Program of the Woods Hole Oceanographic Institution

8.9 Other Citation Details: Woods Hole Oceanographic Institution Contribution Number 3954

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: T.C. Loder

8.2 Publication Date: 1978

8.4 Title: Title: A Semi-automated Total Nitrogen and Phosphorus Method for Low Volume Samples

8.6 Geospatial Data Presentation Form: Unpublished Manuscript

8.8 Publication Information:

8.8.1 Publication Place: Woods Hole, Massachusetts 02543

8.8.2 Publisher: Ocean Industry Program of the Woods Hole Oceanographic Institution

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Nitrate-Nitrite (NN)

The filtrate (less than 0.7 micrometers) was used in the procedure to determine the NN concentration. The basic method was Technicon Industrial Method No. 158-71W/B, which utilizes the reaction in which nitrate was reduced to nitrite by a copper-cadmium reductor column. The nitrite ion then reacted with sulfanilamide under acidic conditions to form a diazo compound. This compound then coupled with N-1-naphthylethylenediamine dihydrochloride to form a reddish-purple azo dye.

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: Technicon Industrial Systems

8.2 Publication Date: 197908

8.4 Title: Technicon Industrial Method No. 158-71W/B; Nitrate-Nitrite in Water and Seawater

8.6 Geospatial Data Presentation Form: Manual

8.8 Publication Information:

8.8.1 Publication Place: Tarrytown, NY 10591

8.8.2 Publisher: Technicon Industrial Systems; A Division of Technicon Instruments Corporation

8.9 Other Citation Details: Technicon AutoAnalyzer II (Methodology)

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Ortho phosphate (OP)

The filtrate (less than 0.7 micrometers) was used in the procedure to determine the OP concentration. The basic method was the Technicon Industrial Method No. 155-71W (1973), which was a modification of the Murphy and Riley (1962) single solution method. The method depended on the formation of a phosphomolybdate blue complex, the color of which is read at a wavelength of 880 nanometers.

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: Technicon Industrial Systems

8.2 Publication Date: 197301

8.4 Title: Technicon Industrial Method No. 155-71W; Ortho Phosphate in Water and Seawater

8.6 Geospatial Data Presentation Form: Manual

8.8 Publication Information:

8.8.1 Publication Place: Tarrytown, NY 10591

8.8.2 Publisher: Technicon Industrial Systems; A Division of Technicon Instruments Corporation

8.9 Other Citation Details: Technicon AutoAnalyzer II (Methodology)

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: J. Murphy

8.1 Originator: J. P. Riley

8.2 Publication Date: 1962

8.4 Title: A Modified Single Solution Method for the Determination of Phosphate in Natural Waters

8.6 Geospatial Data Presentation Form: Published Manuscript

8.8 Publication Information:

8.8.1 Publication Place: unknown

8.8.2 Publisher: Anal. Chim. Acta

8.9 Other Citation Details: Volume 27: page 31

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Ammonia (NH₄)

The filtrate (less than 0.7 micrometers) was used in the procedure to determine the NH₄ concentration. This method was dependent upon the Berthelot Reaction. During this reaction, a blue colored compound closely related to indophenol forms when the solution of an ammonium salt is added to sodium phenoxide, followed by the addition of sodium hypochlorite (Glibert and Loder 1977). A solution of potassium sodium tartrate and sodium citrate was then added to the sample stream to eliminate the precipitation of the hydroxides of calcium and magnesium.

2.5.1.4 Methodology Citation:

8. Citation Information:

8.1 Originator: Patricia M. Glibert

8.1 Originator: Theodore C. Loder

8.2 Publication Date: 197706

8.4 Title: Automated Analysis of Nutrients in Seawater: A Manual of Techniques

8.5 Edition: Publication Number WHOI-77-47

8.6 Geospatial Data Presentation Form: Manual

8.8 Publication Information:

8.8.1 Publication Place: Woods Hole, Massachusetts 02543

8.8.2 Publisher: Woods Hole Oceanographic Institution

8.9 Other Citation Details: Unpublished Manuscript supported by Ocean Industry Program of the Woods Hole Oceanographic Institution

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Dissolved Organic Carbon (DOC)

Water samples are filtered through a precombusted (24 hr at 450 degrees C) Whatman GFF 0.7 micrometer glass fiber filter. The filtrate samples are purged of inorganic carbon by adding 10 percent Hydrochloric Acid and sparged with ultra zero grade air. A 40 microliter aliquot is injected, via an autosampler, into a Shimadzu TOC-500 Organic Carbon Analyzer. A non-dispersive infrared gas analyzer is utilized to measure the carbon dioxide produced and samples are run in triplicate with means reported.

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Total Suspended Solids (TSS)

After the water sample is well shaken, a known volume of sample (75 to 500 milliliters depending on the sediment load) is filtered through a precombusted, preweighed Whatman GFF 0.7 micrometer glass fiber filter. (Filters are weighed on an analytical balance with four place accuracy). The filter is dried in a drying oven at low temperature (less than 50 degrees C) until a stable weight is obtained and normalized for the volume filtered.

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Organic Suspended Solids (OSS)

After the weight is obtained for total suspended solids, the filters are returned to the muffle furnace and combusted at 450 degrees C for 24 hrs. Filters are reweighed and the final weight is subtracted from the total weight and normalized for the volume of water sample filtered. (Filters are weighed on an analytical balance with four place accuracy).

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Inorganic Suspended Solids (ISS)

Inorganic Suspended Solids (ISS) is a calculation of the oxidized weight (weight of filter and the inorganic material that did not volatilize at 450 degrees C) minus the initial precombusted filter weight. Weights are normalized for the volume of water sample filtered.

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols

2.5.1.3 Methodology Description: Chlorophyll a (CHLA)

An appropriate amount of sample (10 or 20 milliliters) is filtered through a 2.5 centimeter, 0.7 micrometer (nominal pore size) GF/F glass fiber filter. The filter is then placed into a scintillation vial with 1 milliliter of saturated magnesium carbonate ($MgCO_3$) and frozen. Samples are removed from the freezer, 9 milliliters of 100 percent acetone are added, and then they are shaken and placed in the refrigerator for 24 hours. The samples are removed from the refrigerator, carefully shaken, and then returned to the refrigerator for an additional 24 hours. After the extraction process is complete, the samples are analyzed with a Fluorometer. Analytical range can be adjusted by changing the volume of sample filtered.

For samples collected from June 2, 1993 to December 20, 1993 a Turner Model 101 Fluorometer with a 430 nanometer filter was used. At the 430 nanometer wavelength, Phaeophytin pigments are indistinguishable from Chlorophyll pigments. As a result, while this fluorometer was in use, a total sample was run first, and then a Phaeophytin a value was obtained by adding 1.0 N Hydrochloric Acid and re-analyzing the sample. The Phaeophytin value was then subtracted from the whole to give the Chlorophyll a value.

Beginning with the January 8, 1994 sample event, a new Sequoia-Turner Model 450 Digital Fluorometer was used with a NB440 nanometer filter. This filter is specific to chl a (FO) only, therefore, it was no longer necessary to analyze Phaeophytin. Researchers attempted to use the 430 nanometer filter (which was used with the old fluorometer) for the July 27, 1994 sampling event in an attempt to return to the original protocol. It was determined that the combination of the Model 450 fluorometer, SC665 Emission filter, and 430 nanometer filter was incompatible, and the resulting data were considered suspect. See the Process Description Section for more information on equations used to determine final Chlorophyll a values for different time periods during the NERRWCHEM database.

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: Turner Designs Inc.

8.2 Publication Date: 198103

8.4 Title: Fluorometric Facts, Chlorophyll and Phaeophytin

8.6 Geospatial Data Presentation Form: Manual

8.8 Publication Information:

8.8.1 Publication Place: Ballentin 101, Mountain View, California

8.8.2 Publisher: Turner Designs

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: Arnold E. Greenberg, APHA, Chairman (Joint Editorial Board)

8.1 Originator: Joseph J. Connors, AWWA (Joint Editorial Board)

8.1 Originator: David Jenkins, WPCF (Joint Editorial Board)

8.1 Originator: Mary Ann H. Franson (Managing Editor)

8.2 Publication Date: 1980

8.4 Title: Standard Methods For the Examination of Water and Waste Water

8.5 Edition: 15th Edition

8.6 Geospatial Data Presentation Form: Book

8.8 Publication Information:

8.8.1 Publication Place: American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005

8.8.2 Publisher: Prepared and Published Jointly by: American Public Health Association (APHA), American Water Works Association (AWWA), Water Pollution Control Federation (WPCF)

8.9 Other Citation Details: Part 1002 G. Chlorophyll, pp. 950-954

2.5.1.4 Methodology Citation:

8. Citation Information

8.1 Originator: L.R. Glover

8.1 Originator: I. Morris

8.2 Publication Date: 1979

- 8.4 Title: Photosynthetic Carboxylating Enzymes in Marine Phytoplankton
- 8.6 Geospatial Data Presentation Form: Published Manuscript
- 8.8 Publication Information:
 - 8.8.1 Publication place: unknown
 - 8.8.2 Publisher: Limnol. Oceanography
- 8.9 Other Citation Details: Volume 23: pp. 80-89

2.5.1 Methodology

2.5.1.1 Methodology Type: Field Collection Procedures and Protocols of Ancillary Data

2.5.1.3 Methodology Description: “Replicate” Sample

In 2001, sampling protocol changed to include collection of two “duplicate” 1000 milliliter samples for each sample #13 collected. The autosampler was programmed to collect two “grab” samples at intervals of two minutes after the last sample collection time (#13). These additional samples enabled comparisons for analysis of laboratory technique accuracy, sample variation, etc. All “duplicate” samples were worked up with the rest of the “core” event samples. The additional samples are not part of the core database, but are considered ancillary data.

2.5.1 Methodology

2.5.1.1 Methodology Type: Field Collection Procedures and Protocols of Ancillary Data

2.5.1.3 Methodology Description: New NERRWCHEM vs LTERDWS sampling protocols: 1992 Calibration Study

LTER DWS samples collected over a 2-week period from 9 November to 24 November, 1992 were compared to samples collected by an autosampler which was the proposed alternative to a person collecting the water sample. The DWS protocol entailed collecting a 1000 milliliter sample by submerging a glass bottle at a depth of 0.5 meters, at approximately 10:00 am every day, and processing the sample immediately. The autosampler was programmed to sample (1000 milliliters) every 5.5 hours at the same depth and was left out for 24 hours at a time. When the DWS sample was collected, the samples from the autosampler were also removed, and the autosampler was reprogrammed to continue sampling at 5.5-hour intervals. The 5.5-hour interval was chosen because it would result in samples collected from every stage of the tide over the 2-week period (Hutchinson and Sklar, 1993). Ice was placed in the autosampler to minimize decomposition or degradation of the samples. This methodology allowed for 5 autosampler samples that were taken within 1 hour of the DWS sample to be processed immediately. An additional four-autosampler samples that were taken within 1 hour of the DWS samples were processed approximately 24 hours after the DWS samples were processed. The data from this study are not part of the core database, but are included as ancillary data. The results and recommendations of the 1992 Calibration Study are unpublished but can be found in the NERRWCHEM hardcopy notebook at the BFML computer lab. For more information on the LTER DWS methodology, please see the LTER DWS Metadata on-line at <http://links.baruch.sc.edu/data/>.

2.5.1.4 Methodology Citation:

8. Citation Information

- 8.1 Originator: Steve E. Hutchinson
- 8.1 Originator: Fred H. Sklar
- 8.2 Publication Date: 1993
- 8.4 Title: Lunar Periods as Grouping Variables for Temporally Fixed Sampling Regimes in a Tidally Dominated Estuary
- 8.6 Geospatial Data Presentation Form: Published Manuscript
- 8.8 Publication Information:
 - 8.8.1 Publication Place: unknown
 - 8.8.2 Publisher: Estuaries
- 8.9 Other Citation Details: Volume 16, Number 4, pages 789-798

2.5.1 Methodology

2.5.1.1 Methodology Type: Laboratory Procedures and Protocols of Ancillary Data

2.5.1.3 Methodology Description: Suspended Sediment Color

Suspended Sediment Color was also determined for each filter. After recording the weight of the dried filter for TSS, each filter color was compared with the Munsell Soil Color Chart. When the color patch on the Munsell chart matched the color of the sediment on the filter, the color code from the Munsell Chart was written down on the sediment datasheet along with the rest of the sediment and filter weight information. The data from this study are not part of the core database, but are included as ancillary data.

2.5.1.4 Methodology Citation:

8. Citation Information

- 8.1 Originator: U. S. Department of Agriculture
- 8.2 Publication Date: 1975
- 8.4 Title: Munsell Soil Color Charts

8.6 Geospatial Data Presentation Form: Handbook/Manual

8.8 Publication Information:

8.8.1 Publication place: 2441 North Calvert Street, Baltimore, Maryland, 21218 USA

8.8.2 Publisher: MUNSELL COLOR (MACBETH, a Division of Kollmorgen Corporation)

2.5.1 Methodology

2.5.1.1 Methodology Type: Field Collection Procedures and Protocols of Ancillary Data

2.5.1.3 Methodology Description: 1993. DWS vs 20 day Overlap

In June of 1993, the NERRWCHEM 20 day sampling overlapped with the LTER DWS sampling regime. In this month both programs were in place, and data from these projects are available for use. The data from this study are not part of the core database, but are included as ancillary data.

2.5.3: Process Step

2.5.3.1 Process Description:

Overall Description

The database is compiled and maintained in yearly MS Excel Workbooks. Prior to 1998, the sediment, nutrient, and chlorophyll data were kept in separate files, processed with SAS (Statistical Analysis System) programs, and then merged into one final yearly file. Any calculations completed in the spreadsheets were found in the separate “Process” files or SAS files, not in the final file. Most of these “Process” files are no longer available. Beginning in 1998, each yearly Excel Workbook is composed of several different tabs (worksheets), including a “FINAL.ALL.YYYY” tab containing the final data for all parameters. The other tabs represent “Process” spreadsheets for particular groups of parameters, such as sediment, nutrient, or chlorophyll. Any calculations or manipulation of the data necessary to achieve the final data take place within these “Process” work sheets. In this way, the critical process/calculation steps can be kept with the final data. The process steps taken to reach the final database are explained below. All data entry was verified, and edited if necessary, by a second data technician or data manager. Archival and documentation of all raw, process, and final data was accomplished as part of the 2003 Data Rescue Project.

Parameter Sheets: Salinity, Tide Elevation, Volume Filtered

1993-1997:

When the water sample reaches the chemistry laboratory, salinity readings are taken with a refractometer and recorded for each water sample on a parameter sheet. The parameter sheets are handwritten data sheets that include: date, site, event #, sample #, time, salinity, high or low tide designation, filter #, sample volume filtered, and any pertinent comments. Hardcopies of these datasheets are maintained on site in the BMFL’s water chemistry laboratory fireproof cabinet. The datasheets have also been scanned into digital format and archived on the NERRWCHEM.RAW Archive CD. A data technician entered these data into yearly “Process” Excel spreadsheets. The high and low tide designations were modified with a designation for each tide stage (ebb low, slack low, flood low, ebb high, slack high, or flood high). These values were later copied directly into the final yearly Excel file.

1998-2001: (Added to Parameter Sheets: TSS, ISS, OSS, and sediment color)

When the water sample reaches the chemistry laboratory, salinity readings are taken with a refractometer and recorded for each water sample on a parameter sheet. Starting in 1998, the parameter sheets began a different format, and contain the sediment data so there is no need for sediment data sheets. The new parameter sheets include: chemistry #, date, site, event #, sample #, time, salinity, tide stage designation, filter #, filter weight, total weight, oxidized weight, and sediment color. Hardcopies of these datasheets are maintained on site in the BMFL’s water chemistry laboratory fireproof cabinet. The datasheets have also been scanned into digital format and archived on the NERRWCHEM.RAW Archive CD. A data technician entered these data into the “parameter.sed” “Process” tab of the yearly Excel Workbook. These values were later copied directly into the final yearly Excel file.

TNW, TNF, TPW, TPF, NN, NH₄, OP

Information on the samples in each tray of nutrients run through the technicon is recorded on a “Run Sheet” by the water chemistry technician. The technicons have a datalogger that calculates the concentrations, puts them into a temporary text file, and produces an output printout with the same information. Hardcopies of both the printouts and run sheets are maintained on site in the BMFL’s water chemistry laboratory fireproof cabinet and have been scanned into digital format and archived on the

NERRWCHEM.RAW Archive CD. In the earlier years (1993-1995), the text file created by the technicon datalogger was also retained and these are archived on the NERRWCHEM.PROCESS CD in the "RawDigitalFiles" directory.

1993-1997:

No corrections are necessary for the orthophosphate (OP), nitrate-nitrite (NN), or Ammonia (NH₄) concentrations from the Technicon printout. A data technician entered these data into yearly MS Excel nutrient files, and later copied the values directly into the final yearly Excel file.

Whole and Filtered Total Nitrogen and Whole and Filtered Total Phosphorus data from the technicon printout do require corrections. A data technician entered these data into yearly TNTP MS Excel files. Within this file, a calculation was performed which took each concentration number, subtracted the Oxidizer Reagent Blank (ORB), and then multiplied the number by the Dilution factor. The ORB values and dilution factors were supplied by the chemist. Once the totals were calculated, they were copied into the final yearly Excel file.

1998-2001:

No corrections are necessary for the ortho phosphate (OP), Nitrate-Nitrite (NN), or Ammonia (NH₄) concentrations from the Technicon printout. After 1998, these data are recorded directly into a "Process" tab labeled "param.nutr", along with the relevant date, site, event #, and sample #. After they have been corrected and certified error-free, they are later copied from this "Process" tab to the FINAL tab.

Whole and Filtered Total Nitrogen and Whole and Filtered Total Phosphorus data from the technicon printout do require corrections. The correction formula was established in the "TNTP" "Process" tab of the Workbook. It takes each concentration number, subtracts the Oxidizer Reagent Blank (ORB), and then multiplies the number by the Dilution factor. The ORB values and dilution factors are supplied by the chemist. Once the totals are verified error-free and the final value is calculated, the final values are copied from the TNTP "Process" tab into the FINAL spreadsheet tab.

Chlorophyll a

1993-1997:

Chlorophyll a (FO) readings from the fluorometer were recorded into a nalgene laboratory notebook. This notebook also contains the sample site, date, door factor, fluorometer gain, sample volume, dilution factor, and other parameters important to the calculation of the final chlorophyll data. The notebook is maintained on site in the BMFL's water chemistry laboratory fireproof cabinet. The notebook pages were also scanned into digital images and archived on the NERRWCHEM.RAW Archive CD. A data technician entered the data from the notebook into a yearly MS Excel chlorophyll spreadsheet. In 1993 and 1994, the Data Manager used this file to run the SAS program, "chlprog", for the final calculated chlorophyll values. These values were then copied into the final yearly Excel file. "Chlaprog" changed throughout this period to adjust for the changes in sample volume and door factors. The program was archived on the NERRWCHEM.PROCESS CD as part of the 2003 Data Rescue Project. Examples of the program can also be found in the NERRWCHEM 1993-2001 Notebook maintained on site at the BMFL. The basic program is as follows:

```
INPUT CREEK $ SAMP DAY DDMMYY6. DOOR $ FO FA VSAMPLE;  
IF DOOR='3X' THEN FD=0.3012;  
IF DOOR='10X' THEN FD=0.1175;  
IF DOOR='1X' THEN FD=0.8523;  
IF DOOR='30X' THEN FD=0.0403;  
IF VSAMPLE=10 THEN VOLFAC=1;  
IF VSAMPLE=20 THEN VOLFAC=0.5;  
CHL_A=FD*2.10*(FO-FA)*VOLFAC;  
PHAE_A=FD*2.10*((1.91*FA)-FO)*VOLFAC;  
RATIO=FO/FA; DROP FD;
```

1998-2001:

Chlorophyll readings were recorded onto new Chlorophyll data sheets that also contained the sample site, date, door factor, fluorometer gain, sample volume, dilution factor, and other parameters important to the calculation of the final chlorophyll data. Hardcopies of the data sheets are maintained on site in the BMFL's water chemistry laboratory fireproof cabinet. The data sheets were also scanned into digital images and archived on the NERRWCHEM.RAW Archive CD. A data technician entered the values from the data sheets into the "param.chla" "Process" tab of the yearly MS Excel Workbook, where final values are calculated in micrograms per liter and copied to the FINAL tab of the Workbook.

Protocol and Calculation Process Documentation (1993-2001):

Calculated chlorophyll values (in micrograms per liter) are derived using the raw data and predetermined door factors and gain factor. For those samples that were acidified, a Tau value is also calculated and incorporated into the formula. Over the course of the database, there have been changes in equipment and protocol. Therefore, with changes in filters, fluorometers, door factor values, etc., the calculation process has also evolved. The following are explanations and formulas for individual time periods of chlorophyll data.

Where,

F_D = Door Factor (as calculated for each door)

FO = Chla reading

FA = Phae reading

Gain = Gain value

Volume filtered = 10 or 20ml, normally 10ml as of 1 May and 20ml on 1 December

Volume Extract = 10ml, from Greenberg et al. (1980)

Tau(T) = acid factor (as calculated)

June 2, 1993 - December 20, 1993; Events 1-11:

The processing of data for this time period was based on a Turner Model 101 Fluorometer with a 430 nanometer filter. Phaeophytin and chlorophyll a are analyzed using this instrumentation. Analytical range can be adjusted by changing the volume of sample filtered. FA was analyzed by the addition of 1.0 N Hydrochloric Acid due to the interference at the 430 nanometer wavelength. Tau is used in the calculation formula.

$\text{Chl (ug/L)} = (F_D((T/T-1)(FO-FA)))$	<u>F_D values</u>	Tau(T) = 1.91
	1x = 0.8523	(T/T-1) = 2.10
$\text{Phae (ug/L)} = (F_D((T/T-1)(1.91FA))-FO)$	3x = 0.3012	
	10x = 0.1175	
	30x = 0.0403	

January 8, 1994 - July 7, 1994; Events 12-21:

The processing of chlorophyll data for this time period was based on a new Sequoia-Turner Model 450 Fluorometer, a SC 665 nanometer emission filter, and a NB 440 nanometer excitation filter. This filter does not allow for the measurement of the FA wavelength and is specific to chlorophyll a (FO) only. Neither Tau nor FA values are used in the final calculation. This filter combination was used for samples from January 8, 1994 through July 7, 1994.

$\text{Chl (ug/L)} = \frac{(F_D)(FO)(50)(\text{vol. extract})}{(\text{vol. filtered})(\text{Gain})}$	<u>F_D values</u>
	1x = 2.19
	3x = 0.14
	10x = 0.03
	30x = 0.021

July 27-28, 1994; Event 22:

The processing of chlorophyll data for this sampling event was based on a different excitation filter than previously used. For this sample event only, the Sequoia-Turner Model 450 Fluorometer and SC 665 Emission filter were used with a 430 nanometer excitation filter. This was an attempt to return to the protocol used with the old Turner Fluorometer during the LTER DWS database and the first few months of the NERR database. This would have made for easier comparisons between the two databases and allowed for the continued collection of phaeophytin data. However, it was determined that the 430 nm filter was not compatible with the SC 665 Emission filter and the Model 450 fluorometer. The fluorometer did not zero correctly, and all data are suspect for this sampling event. Tau and FA values were used in the calculation for these data.

$\text{Chl (ug/L)} = \frac{F_D((T/T-1)(FO-FA))}{(\text{vol. filtered})(\text{Gain})}$	<u>F_D values</u>	Tau(T) = 1.689
	1x = 0.392	(T/T-1) = 2.451
	3x = 0.0256	
	10x = 0.0055	
	30x = 0.00369	

August 16, 1994 - July 23, 1995; Events 23-40:

The processing of chlorophyll data for this time period was based on the Sequoia-Turner Model 450 Fluorometer, SC 665 nanometer emission filter, and NB 440 nanometer excitation filter. The “span” knob was turned to maximum for these sampling events. This filter does not allow for the measurement of the FA wavelength and is specific to chlorophyll a (FO) only. Neither Tau nor FA values are used in the final calculation. In order to correct for the maximum “span” setting, the denominator is multiplied by 6.4.

$$\text{Chl (ug/L)} = \frac{((F_D)(FO)(50)(\text{vol. extract}))}{((\text{vol. filtered})(\text{Gain})(6.4))}$$

F_D values
 1x = 5.38
 3x = 0.379
 10x = 0.09
 30x = 0.053

July 23, 1995 – December 14, 1998; Events 41-102:

Data processing for chlorophyll since July 23 has been completed using the Sequoia-Turner Model 450 Fluorometer, SC 665 nanometer emission filter, and NB 440 nanometer excitation filter. This filter does not allow for the measurement of the FA wavelength and is specific to chlorophyll a (FO) only. Neither Tau nor FA values are used in the final calculation. The “span” knob for this period was turned to minimum, and as a result, it was no longer necessary to use the correction factor (6.4) for maximum span in the denominator.

$$\text{Chl (ug/L)} = \frac{((F_D)(FO)(50)(\text{vol. extract}))}{((\text{vol. filtered})(\text{Gain}))}$$

F_D values
 1x=5.38
 3x=0.379
 10x=0.09
 30x=0.053

January 2, 1999 – December 18, 2001; Events 103-157:

Data processing for this period was the same as above, with the exception of the new door factors listed below.

$$\text{Chl (ug/L)} = \frac{((F_D)(FO)(50)(\text{vol. extract}))}{((\text{vol. filtered})(\text{Gain}))}$$

F_D values
 1x=8.76
 3x=0.46
 10x=0.107
 30x=0.077

Suspended Solids (TSS, ISS, OSS)

1993-1997:

Filter number, weights of pre-weighed filters, dried sample weights for TSS, muffled sample weights for OSS, volume filtered, and sediment color were hand written onto a datasheets. These datasheets were kept in a notebook, which is maintained on site in the BMFL’s water chemistry laboratory fireproof cabinet. In 2003, the datasheets were also scanned into digital images and archived on the NERRWCHEM.RAW Archive CD. A data technician entered all the data from the notebook, except the sediment color, into a yearly MS Excel sediment spreadsheet. In 1993-1995, the Data Manager used a SAS program called “SEDSORT” that compares the sediment filter number in the sediment file and the particular parameter file (created from parameter sheets). It makes another file out of the raw sediment file with just the filter numbers that match the parameter file. A second SAS program called “PARSED” merges the presorted sediment file (from SEDSORT) with the appropriate parameter file, resulting in a merged file with parameters and sediment values. As part of the 2003 Data Rescue Project, versions of the SEDSORT and PARSED SAS programs were archived on the NERRWCHEM.PROCESS CD and in the NERRWCHEM 1993-2001 Notebook.

1998-2001:

Starting in 1998, the weights of the pre-weighed filters, dried sample weights for TSS, muffled sample weights for OSS, volume filtered, and sediment color were recorded on newly designed water parameter sheets. These datasheets are maintained on site in the BMFL’s water chemistry laboratory fireproof cabinet. In 2003, they were scanned into digital images and archived on the NERRWCHEM.RAW Archive CD. A data technician entered the values from the parameter sheets (except for sediment color) into the “parameter.sed” “Process” tab of the yearly MS Excel workbook, where final values were calculated using the following formulas. The final values are then copied to the FINAL tab of the workbook.

Calculations:

Total Sediment value (g) = [Total wt.(g) minus (-) Filter weight(g)].

Organic Sediment value (g) = [Total wt.(g) minus (-) Oxidized wt.(g)]

Inorganic Sediment value (g) = [Total sediment value(g) minus (-) Organic sediment value(g)]

TO CONVERT TO MILLIGRAMS PER LITER:

Total Suspended Solids (TSS) (mg/L) = [[[Total Sediment value (g) times (x) 1000] divided by (/) volume of water sample filtered (ml)] times (x) 1000]

Organic Suspended Solids (OSS) (mg/L) = [[[Organic Sediment value (g) times (x) 1000] divided by (/) volume of water sample filtered (ml)] times (x) 1000]

Inorganic Suspended Solids (ISS) (mg/L) = [[[Inorganic Sediment value (g) times (x) 1000] divided by (/) volume of water sample filtered (ml)] times (x) 1000]

Carbon (DOC)

Information on the samples in each tray run through the Shimadzu Carbon Analyzer is recorded on a “Run Sheet” by the Water Chemistry Technician. The carbon analyzer produces an output printout with three DOC concentrations (in mg/L) and an average of the three concentrations for each sample. Hardcopies of both the printouts and run sheets are maintained on site in the BMFL’s water chemistry laboratory fireproof cabinet and have been scanned into digital format and archived on the NERRWCHEM.RAW Archive CD.

1993-1997:

A data technician entered the average value of the three DOC concentrations into the “Process” nutrient Excel spreadsheet. These values were later copied directly into the final yearly version.

1998-2001:

A data technician entered the average value of the three DOC concentrations into the “param.nutr” “Process” tab of the yearly Excel workbook. They are later copied from this “Process” tab to the FINAL tab.

Ancillary Data (Sediment Color, Grab Samples, and 1992 Calibration Study)

Sediment Color

The sediment color data, including sample date, site, filter number, filter weight, total weight, and oxidized weight were entered into separate MS Excel spreadsheet. As part of the 2003 Data Rescue Project, sediment color data from 1998 to 2001 were input into yearly MS Excel files, called SEDCOLOR. The 1998 - 2001 SEDCOLOR files were appended at the end of an already existing sediment “Process” file for the years 1993-1997. In 2003, all the files were verified, formatted, and included in the NERRWCHEM final database as ancillary data file “NERRWCHEM.SEDCOLOR.1993-2001.xls”.

Grab Samples

Extra grab samples began in 2001. They were labeled 13B and 13C and processed in the laboratory with the same methods as “regular” samples described above. A data technician entered the supplemental data with the rest of the regular samples into each “Process” tab (i.e. Chla, Nutr, Sed, TNTP) of the NERRWCHEM Workbook. However, the final calculated grab data were not included in the “FINAL.ALL.2001” tab or the final database. Final data from the grab samples, including sample #13, were copied into a “GrabSamples-Final” tab of the Workbook; this tab was exported as its own file called 2001.GrabSamples.csv and was placed into the ancillary data directory.

1992 Calibration Study

All documentation regarding the 1992 Calibration Study was scanned into digital format and archived on the NERRWCHEM.RAW Archive CD as part of the 2003 Data Rescue Project. Hardcopies were archived in the NERRWCHEM 1993-2001 Notebook. The original 2-week database includes all the data for the autosampler and the Daily Water Sample samples. The comparison database that compared results between the two techniques was entered into an Excel Workbook in 2003 as part of the Rescue Project. The contents of the file are as follows: one tab contains the data and t-test results for the immediate processing of autosampler and DWS samples with the Technicon; another tab contains the data and t-test results for

24 hour delay in sample workup. These results were included in the final database as ancillary data file "1992Calib.Study.Results.xls".

Creation of Final Database

Yearly water chemistry, sediment, and chlorophyll Excel files from 1993-1997 were manipulated and merged using a SAS program called "Wcchla92-97.merge.sas". (Note: this program can be found in either the NERRWCHEM.PROCESS CD or in the NERRWCHEM 1993-2001 Notebook maintained by the BMFL Data Manager). This program outputs the merged database in a flat file (text). The database was then imported into Excel, verified and formatted. FINAL spreadsheets in the yearly 1998 – 2001 workbooks were verified, formatted for consistency, and merged with the 1993 - 1997 database to form one complete database. The complete database was broken into subcomponents by sample site, graphed, missing data were marked with a missing data marker ".", and anomalous data were assessed and removed if determined to be erroneous. A complete record of missing data and anomalous/erroneous data can be found in the Completeness Report portion of this document. The final sample-site databases were re-combined into a single complete database for users that might prefer a single database.

The complete database, the site specific subcomponent databases, the ancillary databases, and the 1998-2001 "Process" spreadsheets were archived in both .xls and .csv formats on the NERRWCHEM.PUBLISH CD, in the NERRWCHEM notebook, and on-line at <http://links.baruch.sc.edu/data/>.

Process Date: 2003

3 Spatial Data Organization Information:

3.1 Indirect Spatial Reference:

North Inlet and Winyah Bay Estuaries are part of Hobcaw Barony and are located in Georgetown County, South Carolina, USA. Each water chemistry sample site is at a specific point within North Inlet and Winyah Bay Estuaries.

3.2 Direct Spatial Reference Method: Point

5. Entity_and_Attribute_Information:

5.2 Overview_Description:

5.2.1 Entity_and_Attribute_Overview:

Date = The date on which the sample was collected (not necessarily processed or analyzed) in mm/dd/yyyy format.

Site = The location at which the sampling event took place, designated by a two letter code.

Event = The sampling event number assigned to the NERR water chemistry program which is undertaken every 20 days.

Event numbers begin with 1 on June 2, 1993 and end (for the purposes of this database) with 157 on December 18, 2001.

Sample# = Sample number assigned to each sample collected, within event, for the NERR water chemistry program. Samples are collected every 2 hours and 4 minutes, starting with sample 1, over a 26 hour period, to produce 13 samples per event. Starting in 2001, two replicate samples were taken for sample number 13 at two-minute intervals. These samples were labeled 13B and 13C, and are included in the database as ancillary data.

Time = Eastern Standard Time that the water sample was collected at each site, in 24-hour hh:mm format.

TNW, TNF, TPW, TPF: T = Total (i.e. after alkaline persulfate oxidation / digestion)

Second letter = element of interest (i.e. phosphorus or nitrogen)

Third letter = (F or W) whether measurement was from a filtrate having passed through a precombusted 0.7 micrometer GFF Whatman glass fiber filter.

F = (filtered aliquot) measurements taken from a filtrate passed through a precombusted 0.7 micrometer GFF Whatman glass fiber filter.

W = (whole aliquot) the sample was taken straight from the water sample bottle and analyzed.

TNW = Total Nitrogen Whole, TNF = Total Nitrogen Filtered, TPW = Total Phosphorus Whole,

TPF = Total Phosphorus Filtered

OP = Ortho phosphate levels measured from a filtered aliquot (as described above)

NH4 = Ammonia levels measured from a filtered aliquot (as described above)

NN = Nitrate-nitrite levels measured from a filtered aliquot (as described above)

DOC = Dissolved organic carbon levels measured from a filtered aliquot (as described above)

TSS = Total suspended sediments or solids; anything such as zooplankton, algae, sand, etc. that stays on the 0.7 micrometer GFF Whatman filter after filtering the water sample. TSS = total dried sample weight minus the filter weight divided by the volume of water sample filtered.

ISS = Inorganic suspended sediments (solids); the oxidized weight minus the initial precombusted filter weight divided by the volume of water sample filtered

OSS = Organic suspended sediments (solids); = total dried sample weight - oxidized weight (weight of filter and the inorganic material which would not volatilize at 450 degrees C) divided by the volume of water sample filtered.

CHLA = Chlorophyll a levels measured fluorometrically.

SAL = Salinity measured in parts per thousand from a refractometer.

TIDE EL = Tide elevation designation based on NOAA tide charts for Charleston, SC.

SL = slack low

FL = flood low

FH = flood high

SH = slack high

EH = ebb high

EL = ebb low

<u>Variable</u>	<u>Type (total size of value.number of decimal places)</u>	<u>Range of Measurement (min-max)</u>
Date (mm/dd/yyyy)	Integer	1-12, 1-31, 1993-2001
Site	Scaler Alpha	OL, TA, CB, DC
Event	Integer	1-157
Sample#	Integer, Alpha	1-13, 13B, 13C
Time (hh:mm)	Integer	00:00 – 23:59
Total Nitrogen Whole (TNW)	Real 5.1	-0.3 – 388.9
Total Nitrogen Filtered (TNF)	Real 5.1	-2.2 – 133.8
Total Phosphorus Whole (TPW)	Real 4.1	-1.0 – 26.9
Total Phosphorus Filtered (TPF)	Real 4.1	-1.0 – 11.9
Ortho phosphate (OP)	Real 5.2	-0.01 – 10.57
Ammonia (NH ₄)	Real 5.2	0.00 – 42.70
Nitrate/Nitrite (NN)	Real 5.2	0.00 - 70.30
Dissolved Organic Carbon (DOC)	Real 4.1	0.6 – 56.1
Total Suspended Solids (TSS)	Real 6.1	6.3 - 1033.3
Inorganic Suspended Solids (ISS)	Real 5.1	2.5 – 857.3
Organic Suspended Solids (OSS)	Real 5.1	-20.0 – 212.0
Chlorophyll a (CHLA)	Real 6.2	0.00 – 204.27
Salinity (SAL)	Integer	0 - 38
Tide Elevation (TIDE EL)	Scaler Alpha	SL, FL, FH, SH, EH, EL

*Range of measurement values are actual highest and lowest values collected during the database timeframe. They may include values that are considered anomalous.

5.2.2 Entity and Attribute Detail Citation:

Definitions were developed by Baruch Institute's researchers, data managers, and technicians; no published standards for entity definitions were used to define the entities used in this dataset. However, the general use of these entity type definitions are understood by the chemical and ecological communities at large.

6. Distribution Information

6.1 Distributor:

10.2 Contact Organization Primary

10.1.2 Contact Organization:

10.1.1 Contact Person:

Univ. of South Carolina's Baruch Institute

Ginger Ogburn-Matthews

10.3 Contact Position:

Research Data Manager & Analyst

10.4 Contact Address

10.4.1 Address Type:

Mailing Address

10.4.2 Address:

USC Baruch Marine Field Lab

10.4.2 Address:

PO Box 1630

10.4.3 City:

Georgetown

10.4.4 State or Province:

South Carolina

10.4.5 Postal Code:

29442

10.4.6 Country:

USA

10.5 Contact Voice Telephone:

(843) 546-6219

10.7 Contact Facsimile Telephone:

(843) 546-1632

10.8 Contact Electronic Mail Address: ginger@belle.baruch.sc.edu
10.9 Hours of Service: 8:30 am to 4:30 pm EST/EDT Mon.- Friday

6.2 Resource Description:

Dataset Identification names:

North Inlet-Winyah Bay NERR Water Chemistry Data
NERRWCHEM Database
NIW NERR Data
North Inlet Ecosystem Monitoring

Identification of Directories and Files:

The NERRWCHEM.PUBLISH CD contains the complete Final 1993-2001 Database, graphics, and metadata including the following files in the following directories:

FINAL.DOCUMENTATION: (Directory Size: 1.05 MB, 1 folder, 12 files)

FGDC.NERRWCHEM.1993-2001.doc
FGDC.NERRWCHEM.1993-2001.txt
NERRWCHEM.Sites.DOQQ.jpg

SitePhotos (Directory Size: 492 KB, 9 files)

CB.Dock.ISCO.jpg
Clambank.jpg
DC.Float.jpg
DC.ISCO.Float.jpg
OL.ISCO.jpg
OysterLandingAerial.jpg
TA.ISCO.jpg
TA.Bridge.ISCO.jpg
WaterChemLab.jpg

FINAL.DATA (Directory Size: 10.1 MB, 6 folders, 37 files)

NERRWCHEM.ALL.1993-2001.xls
NERRWCHEM.ALL.1993-2001.csv

FinalDataBySite (Directory Size: 1.71 MB, 8 files)

CB.NERRWCHEM.1993-95.2001.xls
CB.NERRWCHEM.1993-95.2001.csv
DC.NERRWCHEM.1998-2001.xls
DC.NERRWCHEM.1998-2001.csv
OL.NERRWCHEM.1993-2001.xls
OL.NERRWCHEM.1993-2001.csv
TA.NERRWCHEM.1994-2001.xls
TA.NERRWCHEM.1994-2001.csv

FinalYearlyWorkbooks (Directory Size: 6.56 MB, 4 folders, 27 files)

README.txt

1998 (Directory Size: 1.13 MB, 6 files)

1998.NERRWCHEM.Final.xls
Final.ALL.1998.csv
Param.chla.csv
Param.nutr.csv
Parameter.sed.csv
TNTP.csv

1999 (Directory Size: 1.40 MB, 6 files)

1999.NERRWCHEM.Final.xls
Final.ALL.1999.csv
Param.chla.csv
Param.nutr.csv

Parameter.sed.csv
TNTP.csv

2000 (Directory Size: 2.03 MB, 6 files)

2000.NERRWCHEM.Final.xls
Final.ALL.2000.csv
Param.chla.csv
Param.nutr.csv
Parameter.sed
TNTP.csv

2001 (Directory Size: 1.98 MB, 7 files)

2001.NERRWCHEM.Final.xls
Final.ALL.2001.csv
Param.chla.csv
Param.nutr.csv
Parameter.sed.csv
TNTP.csv

FINAL.GRAPHICS (Directory Size: 148 MB, 12 folders, 374 files)

CB (Directory Size: 24.5 MB, 2 folders, 65 files)
Summary (Directory Size: 5.77 MB, 13 files)
Annual (Directory Size: 18.7 MB, 52 files)

DC (Directory Size: 25.2 MB, 2 folders, 64 files)
Summary (Directory Size: 6.32 MB, 13 files)
Annual (Directory Size: 18.9 MB, 51 files)

OL (Directory Size: 51.9 MB, 2 folders, 129 files)
Summary (Directory Size: 8.33 MB, 13 files)
Annual (Directory Size: 43.6 MB, 116 files)

TA (Directory Size: 46.2 MB, 2 folders, 116 files)
Summary (Directory Size: 7.78 MB, 13 files)
Annual (Directory Size: 38.4 MB, 103 files)

ANCILLARY.DATA (Directory Size: 2.69 MB, 2 folders, 9 files)

NERRWCHEM.SEDCOLOR.1993-2001.XLS
NERRWCHEM.SEDCOLOR.1993-2001.CSV
2001.GrabSamples.csv

1992.Calib.Study (Subdirectory Size: 31.4 KB, 3 files)

1992Calib.Study.Results.xls
autosmpFinaldata.csv
dwsOLFinalCalcn.csv

1993.DWSvs20dayOverlap (Subdirectory Size: 1.37 MB, 4 files)

1993DWSvs20dayAnalysis.xls
1993DWSvs20dayData.xls
1993DWSvs20day.dg5 (Deltagraph version 5 document)
OL.CHLA.jpg

The NERRWCHEM.PROCESS 1993-2001 CD contains various “Process” files created over the course of the database. These “Process” files include programs, versions of metadata, versions of merged data, raw digital files, and the files used to create the final graphics in the graphing software packages (SigmaPlot and Deltagraph).

The NERRWCHEM.RAW Archive CD contains scanned digital versions of the raw data. The raw data include parameter sheets, run sheets for chemical analyses, output from the Technicon AutoAnalyzer and Shimadzu Cargon Analyzer, 1992 Calibration data, and the contents of laboratory notebooks.

6.3 Distribution Liability:

According to the Belle W. Baruch Institute for Marine Biology and Coastal Research:

The datasets are only as good as the quality assurance and quality control procedures outlined in the Metadata. The user bears all responsibility for its subsequent use in any further analyses or comparisons. No warranty expressed or implied is made regarding the accuracy or utility of any data collected, managed, or disseminated for general or scientific purposes by the Belle W. Baruch Institute for Marine Biology and Coastal Research. This disclaimer applies both to individual use of the data and aggregate use with other data. It is strongly required that these data be directly acquired from the Belle W. Baruch Institute for Marine Biology and Coastal Research and not indirectly through other sources which may have changed the data in some way. It is strongly recommended that careful attention be paid to the contents of the metadata file associated with these data. Neither the Belle W. Baruch Institute for Marine Biology and Coastal Research, nor the National Oceanic & Atmospheric Administration's Office of Ocean and Coastal Resource Management, Estuarine Reserves Division shall be held liable for the use and/or misuse of the data described and/or contained herein.

6.4 Standard Order Process

6.4.2. Digital Form

6.4.2.1 Digital Transfer Information

6.4.2.1.1. Format Name: EXCEL (.XLS) or WORD (.DOC) format as well as .CSV or .TXT (text only) format.

6.4.2.1.2 Format Version Number: Microsoft Office Professional 2000

6.4.2.1.6 File Decompression Technique: No compression applied

6.4.2.2 Digital Transfer Option

6.4.2.2.1.1 Computer Contact Information

6.4.2.2.1.1.1 Network Address

6.4.2.2.1.1.1.1 Network Resource Name: <http://links.baruch.sc.edu/data/>

6.4.3 Fees: None

6.5 Custom Order Process:

If requesting Non-digital (Paper (hard copy) printout), a fee of \$50 per hour (with a one-hour minimum) plus the cost of supplies will be imposed. As an offline option, CD-ROMs are available at the cost of \$5.00 each. This fee pays for the CD, the creation of the CD, and mailing charges.

7. Metadata Reference Information

7.1 Metadata Date: 200302

7.2 Metadata Review Date: 200304

7.4 Metadata Contact:

10.2 Contact Organization Primary

10.1.2 Contact Organization:

Univ. of South Carolina's Baruch Institute

10.1.1 Contact Person:

Ginger Ogburn-Matthews

10.3 Contact Position:

Research Data Manager & Analyst

10.4 Contact Address

10.4.1 Address Type:

Mailing Address

10.4.2 Address:

USC Baruch Marine Field Lab

10.4.2 Address:

PO Box 1630

10.4.3 City:

Georgetown

10.4.4 State or Province:

South Carolina

10.4.5 Postal Code:

29442

10.4.6 Country:

USA

10.5 Contact Voice Telephone:

(843) 546-6219

10.7 Contact Facsimile Telephone:

(843) 546-1632

10.8 Contact Electronic Mail Address:

ginger@belle.baruch.sc.edu

10.9 Hours of Service:

8:30 am to 4:30 pm EST/EDT Mon.- Friday

7.5 Metadata Standard Name:

Content Standard for Digital Geospatial Metadata, Part 1: Biological Data Profile

7.6 Metadata Standard Version: FGDC-STD_001.1-1999